Center Innovation Fund: KSC CIF

Generation of Chemical Commodities and Fertilizer from ISS and ISRU Water Brines Using Combined Ion Exchange and Electrodialysis

Completed Technology Project (2017 - 2018)

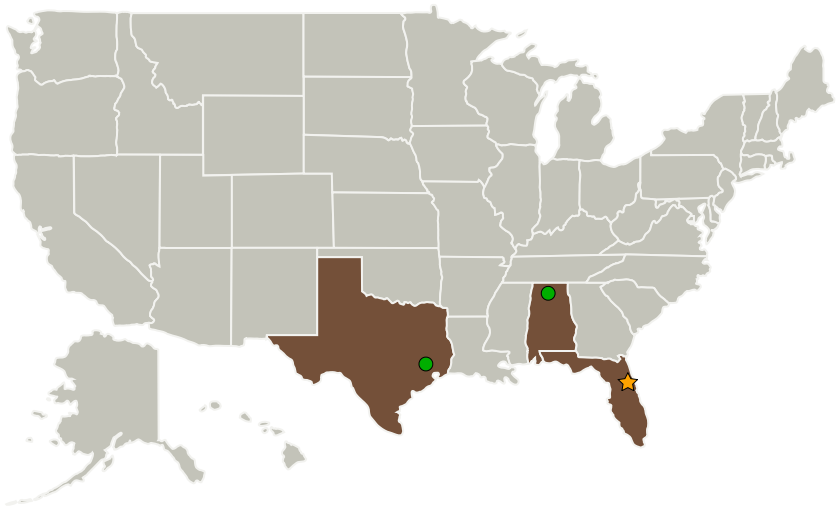
Project Introduction

The goal is to develop a next generation brine recovery and electrolysis grade potable water producing system for Environmental Control and Life Support System (ECLSS) use. The project will combine previously-developed waste water brine ion exchange pretreatment system with a modified electrodialysis unit to produce purified water and other useful chemicals. The combining of these two systems has not yet been attempted. This system would take water from various sources such as ISS brines, water generated via ISRU regolith processes, or Mars/Lunar polar deposits and generate drinking or electrolysis-grade water, fuel, and other useful chemicals to significantly reduce consumable use, resulting in more closed-loop, sustainable systems. The goal is to validate the mass and energy balances, attempt to optimize the system, and gain lifecycle insight. The envisioned deliverables of this project will be 1) A system which can deliver purified electrolysis grade water which can be used for drinking water or propellant production, and 2) Produce useful chemicals isolated for use as fertilizers and ion exchange membrane regeneration.

Anticipated Benefits

Create a closed-loop water purification system for the ISS to reduce resupply of water and chemicals with significant cost savings. The goal is to increase water recovery on the ISS from 85% to 92-98%, resulting in an estimated cost savings of $60 to $120 million per year. The proposed process (chlor-alkali) is an established industrial process, but it has not been used for spacecraft ECLSS/ISRU applications (TRL 1)

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
★Kennedy Space Center(KSC)	Lead Organization	NASA Center	Kennedy Space Center, Florida
●Johnson Space Center(JSC)	Supporting Organization	NASA Center	Houston, Texas
●Marshall Space Flight Center(MSFC)	Supporting Organization	NASA Center	Huntsville, Alabama
Pioneer Astronautics	Supporting Organization	Industry Historically Underutilized Business Zones (HUBZones)	Lakewood, Colorado

Primary U.S. Work Locations	
Alabama	Florida
Texas	

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Kennedy Space Center (KSC)

Responsible Program:

Center Innovation Fund: KSC CIF

Project Management

Program Director:

Michael R Lapointe

Program Manager:

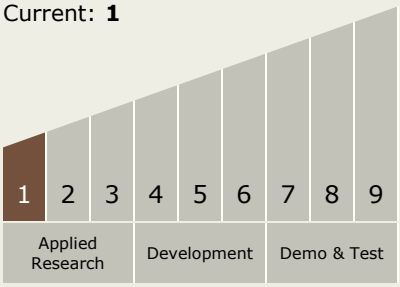
Barbara L Brown

Principal Investigator:

Anthony C Muscatello

Technology Maturity (TRL)

Start: **1**
Current: **1**



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Technology Areas

Primary:

- TX07 Exploration Destination Systems
  - TX07.1 In-Situ Resource Utilization
    - TX07.1.3 Resource Processing for Production of Mission Consumables

Target Destinations

Earth, Mars, Outside the Solar System